Nutrition in the perioperative period

Module 17.2.

Enhanced Recovery: Principles

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Learning Objectives:

• Understand the key concepts underpinning modern perioperative care;
• Know the principle domains within an ERAS protocol (pain, GI function and mobilisation);
• Be able to discuss practical aspects of patient management to attain optimal organ function and recovery in the perioperative period;
• Understand the importance of the multidisciplinary team, unit organisation, patient information, discharge criteria and audit within an ER programme;
• Gain insight into the key outcomes that are possible with an ER approach;

Contents:

1. Introduction
2. ERAS: the core concept
3. The multidisciplinary team
4. Elements of the ERAS protocol
5. Unit organisation/patient information
6. Discharge criteria
7. Audit
8. Implementation and compliance
9. Outcomes
10. Summary
11. References

Key Messages:

• Enhanced recovery is simply integrated, evidence-based, modern perioperative care;
• All patients undergoing major surgery should receive optimal nutritional and metabolic care to maintain homeostasis and promote rapid recovery.

1. Introduction

The rapid development and improvement of perioperative care in recent years has made it possible to completely review perioperative nutritional care for most patients. With the introduction of Enhanced Recovery After Surgery (ERAS) protocols for most major surgical procedures, both the metabolic and functional circumstances for nutritional care has greatly improved. In this change of care, nutritional care is a key component. In order to successfully apply modern nutritional perioperative care it is essential to understand the basis of ERAS and to change practice from traditional care to modern perioperative care according to ERAS protocols. This module gives an overview of the ERAS protocols and how they impact nutritional care and outcomes.

Traditional peri-operative care has generally accepted that a stress response to major surgery is inevitable. This concept has recently been challenged with the view that a substantial element of the stress response can be avoided with the appropriate application of modern anaesthetic, analgesic and metabolic support techniques. These changes minimize the catabolic response to the surgery and allow nutrients to be handled in a more normal way than in traditional care where severe stress was prevailing. Conventional postoperative care has also emphasised prolonged rest for both the patient and their gastrointestinal tract. Similarly, this concept has recently been challenged. This conceptual change has major impact on the patients nutritional care. In the catabolic patient, medium-term
functional decline will ensue if active steps are not taken to return the patient to full function as soon as possible. These two concepts have been combined to produce a new view of how surgical patients should be cared for (the Enhanced Recovery After Surgery (ERAS) protocol). Using a multidisciplinary team approach with a focus on stress reduction and promotion of return to function, an ERAS protocol aims to allow patients to recover more quickly from major surgery, avoid medium-term sequelae of conventional postoperative care (e.g. decline in nutritional status and fatigue), reduce the risk for complications, and reduce health care costs by reducing hospital stay.

The move from traditional peri-operative care to an ERAS protocol is not straightforward. None of the elements within ERAS protocols have been proven to be pivotal in randomised trials. However, the Enhanced Recovery After Surgery (ERAS) group produced a comprehensive consensus of approximately 20 elements for patients undergoing colorectal resection in 2005 (1). This protocol has been tested extensively, and a prospectively audited case-series including >1000 patients was published in 2009 (2). The protocol was recently updated (3) and the latter forms the basis for current recommendations.

To date, the most frequently used model for ERAS has been open colorectal resection. However, there is no doubt that the same principles can be applied successfully to most other forms of major surgery [for instance most hepatic resection (4)]. Equally, the last 20 years has seen the revolution in laparoscopic surgery making a real impact on the rate at which patients recover from procedures such as cholecystectomy. At present the boundaries of laparoscopic surgery are being advanced into other domains including colorectal resection. What is likely is that whether surgery is preformed by ‘open’ or laparoscopic means, if an ER protocol is not followed then the potential for the optimal recovery rate will not be achieved.

2. ERAS: the Core Concept

The core concept in enhanced recovery is to maintain homeostasis and organ function throughout the patient’s surgical journey. The key question to be asked by all involved is “what is keeping my patient from recovering and going home?” The three domains thought to be critical for recovery are:

- pain control
- gut function
- mobilisation

Every action of all staff involved in the multidisciplinary care of surgical patients must be focused on how to deliver optimal care in these three domains. Pain control is aiming at keeping the patient pain free throughout the recovery, initially with the use of thoracic epidurals, later on only oral analgesics. Gut function will be supported to have return to intake of normal food for nutritional needs as soon as possible and the return of bowel movements. The patients should be mobilised as quickly as possible aiming to return to normal preoperative levels as soon as possible.

3. The Multidisciplinary Team

In order to implement an ERAS protocol there must be an enthusiastic multidisciplinary team. Members of the team necessarily include nurses, anaesthetists and surgeons. However, it is vital to include the co-ordinated help from dieticians, physiotherapists and occupational therapists. Equally, the success of a programme will certainly depend on the involvement of hospital management and the audit team. Implementation is often a radical and sometimes painful process and no member of the team should be focussed on one single area of the patient’s journey. Every member of the team should be trying to optimise outcome right from the first attendance at the out-patient clinic to the time of discharge home.

4. Elements of the ERAS Protocol

Individual protocol elements combine to optimise perioperative fluid balance, provide dynamic analgesia, enforce early mobilisation and encourage early oral feeding. Evidence for the efficacy of these individual protocol elements is often extrapolated from traditional care pathways (1, 3). It is important to appreciate that individual protocol elements tend to synergise with each other. Thus optimal gut function is achieved not only with use of a thoracic epidural but also when good fluid balance is achieved. If the patient receives excess intravenous fluids to counteract epidural-related
should also be given a clear role with specific tasks to perform, including targets for food intake and
hypotension then any benefit on gut function from the epidural will be overwhelmed by fluid overload
and gut-oedema/dysfunction. Insights to and understanding of the fluid balance in the perioperative
care has recently been shown to be very poor and yet of great importance for gut function but also for
general outcomes after surgery. For this reason a special module is dedicated to this topic (see
module 17.3). The following section discusses many of the key individual elements of the ER
approach and tries to put each in context with the other.
Perioperative fluid balance may be optimised through avoiding routine mechanical bowel preparation
(5, 6), restricting unnecessary preoperative fasting (7) and providing preoperative oral carbohydrate
loading. In the postoperative period intravenous fluid and sodium is restricted in favour of oral fluids
which should be commenced on the first postoperative day (8). Hypotension related to epidural
anaesthesia can be treated with judicious use of a vasopressor (9). Individually these elements have
been shown to reduce preoperative anxiety (10), improve postoperative insulin sensitivity (11) and
reduce complications and length of stay (12, 13).
Within an ERAS protocol anaesthesia based on intravenous or short acting volatile agents is favoured
along with avoidance of pre-anaesthetic medication (14). These measures help to reduce both delay
to mobilisation and oral intake in the immediate postoperative period. Intraoperative epidural
analgesia, achieves both analgesia and sympathetic blockade which will contribute to a reduction in
the postoperative stress response, insulin resistance (15) and gut paralysis (16). Epidural analgesia in
the postoperative period provides dynamic analgesia for both open (17) and laparoscopic surgery (18,
19) without the side-effects of sedation. Step-down analgesia is usually paracetamol and non-steroidal
anti-inflammatory drugs. Careful management of the transition between epidural and oral analgesia is
key to minimising the exposure of patients to systemic opioids.
Early postoperative feeding is encouraged (20) in the presence of a multi-modal anti-ileus package
(21), even in the presence of an intestinal anastomosis. Early oral/enteral feeding has been associated
with a reduced postoperative stay (22). Postoperative oral nutritional supplements are provided as
they are of clear benefit in malnourished patients (23) and may benefit patients that are not
malnourished (24, 25). When used in combination with preoperative carbohydrate loading and epidural
analgesia enteral feeding have been shown to allow the maintenance of nitrogen equilibrium (26).
Elements of the ERAS protocol aim specifically to reduce postoperative nausea, vomiting and ileus.
Routine intraoperative and postoperative antiemetics and reduced exposure to systemic opiates are
important (27, 28). This is combined with maintenance of fluid balance (29, 30), epidural analgesia
(31, 17, 16) and early mobilisation. It is the combination of all of the above measures that act in
synergy to secure that normal food can form the basis for the nutritional care in the ERAS protocol.
Laparoscopy has not been universally adopted in ERAS protocols. However, it has certainly been
shown to reduce short-term wound morbidity, time to gastrointestinal recovery and length of hospital
stay within traditional care (32). Short, transverse incisions improves rate of postoperative recovery
(33) and may reduce analgesic requirement and pulmonary compromise (34).
Peritoneal drains are avoided as they inhibit mobilisation and their use does not reduce the incidence
or severity of anastomotic leaks (35, 36). Similarly urinary catheters are removed early, this may be
possible within 24 hours of surgery (8). As protracted bed rest increases insulin resistance and muscle
loss (along with other medical complications), mobilisation is encouraged and facilitated. Measures
generally accepted within traditional care such as antibiotic prophylaxis, thromboprophylaxis,
avoidance of routine nasogastric tubes and avoidance of perioperative hypothermia are employed
within the ERAS protocol.
Following an ERAS protocol allows gastrointestinal function to recover earlier, nutritional status to be
maintained and postoperative exercise tolerance to improve (37).

5. Unit Organisation / Patient Information

For an ERAS protocol to work well it is important that the surgical unit is re-organised. For example,
schedules for theatre should take account of the fact that the ERAS patients should ideally be first on
the list so that they have the afternoon and evening to start recovery. Equally, the ward space should
be organised so that there is room for the patients to mobilise even with their epidurals (ambulatory
epidurals). Moreover, patients should be encouraged to walk to a communal eating area for meals.
Food and snacks should be freely available for when patients want to eat.
Explicit preoperative patient information can facilitate postoperative recovery and pain control,
particularly in patients who exhibit the most denial and highest levels of anxiety (38). A clear
explanation of what is to happen during hospitalisation facilitates adherence to the care pathway and
allows timely recovery and early discharge (39, 40). Importantly, at this first encounter the patient
should also be given a clear role with specific tasks to perform, including targets for food intake and
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oral nutritional supplements and targets for mobilisation, during the postoperative period (41, 42). Providing a diary for patients to complete the targets for each day can help focus both the patient and the staff on the protocol.

6. Discharge criteria

Patients can be discharged when they meet the following criteria:

- good pain control with oral analgesia
- taking solid food, bowel movements and no intravenous fluids
- independently mobile or same level as prior to admission
- all of the above, no complication in need of hospital care and willing to go home

The discharge process starts at the preadmission counselling session when it is determined if the patient lives alone and has any special needs (e.g., transport, social support, etc.). Problems that will delay discharge must be addressed at this time rather than once the patient has been admitted. It is clear that in most centers there is a delay between the time when the patient is recovered functionally and when they are actually discharged home (43). Minimising this delay requires optimal discharge planning.

7. Audit

All good surgical practice is based on ongoing audit. It is essential that outcomes be documented, particularly during the introduction of an ERAS programme, but also for the maintenance of a functional ERAS programme. This not only ensures that morbidity and mortality are optimal but that feedback is provided on aspects of the programme that may need further development of infrastructure/staff education.

8. Implementation and Compliance

The determinants of outcome within an ERAS programme are important to know so that protocols can be used to maximum efficiency on the correct groups of patients. It is evident that a protocol is not enough to implement an ERAS programme and that compliance with the protocol both pre-op and post-op is vital if good results are to be obtained (43). Compliance is a complex issue that requires audit of the process throughout the patient’s journey, ongoing motivation from the team leaders, support from the hospital managers and regular/ongoing (re-)education of staff. Equally, it is evident that although good functional recovery may be obtained with experience and protocol compliance, the organisation of healthcare services to facilitate discharge into the community needs to be optimal if the delay between a patient’s functional recovery and their actual discharge date is to be kept to a minimum.

9. Outcomes

Enhanced recovery protocols have been developed to address the sequelae of the metabolic response to elective surgery and to accelerate recovery by attenuating the stress response so that the length of hospital stay and possibly the incidence of postoperative complications and mortality can be reduced, with the added benefits of reducing healthcare costs. These outcomes are difficult to address in small individual trials from single centers. A recent meta-analysis has, however, reported on six randomised trials of patients (n=452) undergoing major elective open colorectal surgery (44). The number of individual ERAS elements used ranged from 4 to 12 with a mean of 9. The length of hospital stay was reduced by 2.5 days and complication rates were significantly reduced (relative risk [95% CI] : 0.53 [0.44, 0.64]). There were no statistically significant differences in readmission and mortality rates. Such evidence suggests that ERAS pathways do indeed reduce the length of stay and complication rates after major open colorectal surgery without compromising patient safety. Evidence from the literature supports the view that an ERAS pathway seems to reduce the overall healthcare cost (45, 46). From a health economics point of view, the data suggest that, with the decrease in complications and hospital stay and similar readmission rates, the cost of treatment per patient would be significantly lower for those treated within an ERAS pathway than those receiving traditional care, despite the need for dedicated staff to implement the pathway.
Ultimately, outcomes are determined by the nature of the intervention and the pre-existing condition of the patient. In a large case-series of patients undergoing open colorectal resection (n=1035) and managed within an ERAS programme (2) it was reported that independent predictors of delayed mobilisation were comorbidity (ASA grade III and IV) and age >80yrs. Prolonged hospital stay was also related to comorbidity and advanced age but also the magnitude and technical difficulty of the surgery. ERAS programmes have developed considerably since first initiated by Kehlet in the 1980’s. The individual elements that make up such programmes will continue to evolve. However, it would now appear that current programmes can indeed minimise the impact of surgery and its sequelae and that limiting factors that may dominate in the future will be related to pre-existing comorbidity and old age. Such issues constitute some of the real challenges for ERAS protocols in the future.

10. Summary

Optimal nutritional and metabolic care should be provided for all patients undergoing major surgery. In a modern context this is best provided within a multimodal care pathway that aims to maintain homeostasis and optimise recovery of organ function. In addition to an evidence-based protocol, such an enhanced recovery pathway requires unit re-organisation, education of staff, repeated implementation, and monitoring of protocol compliance and outcomes.

11. References


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